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MEMORANDUM

Date: 24 May 2005

To: Joanne LaBaw, Task Monitor, EPA Region 10, Seattle, Washington

From: David Dinkuhn, START Field Leader, Weston, Seattle, Washington

Through: Greg Stuesse, START Project Manager, Weston, Seattle, Washington

Subject: Preliminary Hazard Ranking System (HRS) Score
Musick Mine PA/SI
Lane County, Oregon

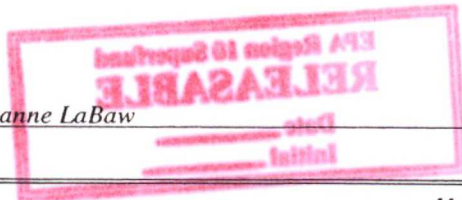
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HRS scores were developed for the Musick Mine site located in Lane County, Oregon. The Musick Mine site is divided into two separate watersheds: Upper Musick Mine and Lower Musick Mine. A score of 6.0 was derived for the Upper Musick Mine watershed, and a score of 13.43 was derived for the Lower Musick Mine watershed. According to the HRS Final Rule, the highest site score from all watersheds evaluated (13.43) has been selected as the overall site score for Musick Mine. The HRS scores were developed as part of a combined Preliminary Assessment/Site Inspection (PA/SI) conducted by Weston Solutions Inc. (Weston) on the Musick Mine. The scores are based on United States Environmental Protection Agency (EPA) site files; federal, state, and local government documents; public documents; target information; PA/SI sampling; and professional assumptions when necessary.

This memorandum summarizes the data and assumptions used to develop the site score using HRS Quickscore software, Version 2.2. The HRS scoresheets for the site are provided as Attachment 1. The following information and assumptions were used to derive the score.

Waste Source Characteristics

Waste characteristics for each of the migration pathways and the soil exposure pathway were assessed for each area. Waste characteristic factor values generated for the migration pathways and soil exposure are summarized in the table below.



Upper Musick Mine						
Groundwater Pathway	Surface Water Pathway			Soil Exposure		Air Pathway
	Drinking Water	Human Food Chain	Environmental	Residential	Nearby Population	
6	18	180	180	18	18	3
Lower Musick Mine						
Groundwater Pathway	Surface Water Pathway			Soil Exposure		Air Pathway
	Drinking Water	Human Food Chain	Environmental	Residential	Nearby Population	
6	18	180	180	18	18	3

The Musick Mine is a former gold mine that was commercially active between 1891 and 1931. Silver, lead, and zinc ore were reportedly mined in addition to gold. The mine is located in the Bohemia mining district within the Umpqua National Forest in southwestern Oregon. Major features remaining at the mine site consist of several adits, large associated waste rock piles, and a relatively smaller tailings pile. All mine processing equipment used historically, including a former stamp mill, gravity concentrator, and ore bin, has been removed from the site. The site straddles Bohemia saddle, a drainage divide that separates the site into two watersheds (Upper and Lower Musick Mine). Mine features located on the eastern side of the saddle (Upper Musick Mine) are drained by City Creek, the headwaters of which originate on the mine site. Mine features located on the western side of the saddle (Lower Musick Mine) are drained by Glenwood Creek. The headwaters of Glenwood Creek originate a short distance upstream of the mine property. Investigation results for the potential source areas identified during the PA/SI are summarized below.

- Upper Musick Mine— Potential waste sources investigated at the Upper Musick Mine consist of surface water from one of the two adits present (Upper Musick Mine Adit), two waste rock piles, a tailings pile, and surface soil at the location of the former stamp mill. These potential sources were assessed for contaminants of concern (COCs) consisting of target analyte list (TAL) metals in all samples and polychlorinated biphenyls (PCBs) in the soil sample from the stamp mill area. COCs detected in the samples at concentrations significantly above background consist of 13 metals including: antimony, arsenic, cadmium, chromium, cobalt, copper, lead, manganese, mercury, selenium, silver, thallium and zinc. PCBs were not detected. Of the 13 metals, arsenic, cadmium, copper, lead, manganese, and zinc were detected in adit surface water at significant concentrations. With the exception of manganese, concentrations of all of the aforementioned metals in either waste rock, tailings pile, or surface soil significantly exceeded background concentrations.
- Lower Music Mine— Potential waste sources investigated at the Lower Musick Mine consisted of surface water and sediment from the Lower Musick Mine Adit and a soil

sample from the waste rock pile. The samples were analyzed for TAL metals. Twelve metals were detected at concentrations significantly above background including: antimony, arsenic, cadmium, cobalt, copper, lead, manganese, mercury, nickel, selenium, silver, zinc. Of the 12 metals, only manganese and zinc were detected in adit surface water at significant concentrations. However, with the exception of copper and silver, concentrations of all of the aforementioned metals in adit sediment significantly exceeded background. With the exception of cobalt, manganese, nickel, and selenium, concentrations of all of the aforementioned metals in the waste rock pile significantly exceeded background concentrations.

For both mine areas, a minimum default value of 10 was used as the hazardous waste quantity factor value for the groundwater, surface water, soil exposure, and air migration pathways based on following:

- Based on Table 2-6 of the HRS Final Rule, source hazardous waste quantity values estimated for each source generated a maximum hazardous waste quantity factor value of 1. However, a minimum default value of 10 was used because the hazardous constituent quantities have not been adequately determined for these sources. Also, targets subject to Level I and/or II concentrations for the groundwater, surface water, and air migration pathways have not been identified.

In generating the waste characteristics values, the most hazardous substances associated with the sources listed above were used in assigning toxicity, mobility, persistence, and bioaccumulation potential values as detailed below.

- Groundwater—Mercury, which is present in the sources at both the Upper and Lower Musick Mines, was used as representative of the most hazardous substance for the groundwater pathway. A toxicity/mobility value of 100 was generated for both mine areas.
- Surface Water—Of the metals detected in the site sources, mercury is representative of the most hazardous under the surface water pathway for both mine areas. As listed in the 2004 SCDM, this substance has a toxicity factor of 10,000, a persistence factor of 1, and a bioaccumulation factor of 50,000.
- Soil—Mercury was used as representative of the most toxic metal in surface soil at both mine areas. The mercury toxicity factor value is of 10,000.
- Air—Mercury was used as representative of the most toxic metal in surface soil at both mine areas. A corresponding toxicity/particulate mobility factor value of 80 was generated. A particulate mobility factor value of 0.008 was assigned based on Figure 6-3 of the HRS Final Rule.

Groundwater Migration Pathway

The groundwater pathway for both mine sites received a pathway score of 0. Potential sources were assumed to consist of contaminated soil in the waste rock piles, tailings pile, and stamp mill area. Factors and assumptions used to evaluate the groundwater pathway scores are summarized below.

- The following factors contributed to a likelihood of release category factor value of 400:
 - A containment factor value of 10 was assumed for these sources as liners, active run-on/runoff control systems, functioning leachate collection systems, and/or maintained engineered covers have not been documented to exist.
 - The mean annual precipitation for the area is 55.3 inches per year. Based on Figure 3-2 in the HRS Final Rule, the net precipitation factor value is 10.
 - Depth to groundwater at the mine sites is unknown and was conservatively assumed to be less than 25 feet. The corresponding depth to aquifer factor assigned is 5.
 - The site aquifer was assumed to consist of low permeability fractured bedrock and a hydraulic conductivity of 10^{-5} centimeters per second (cm/sec) is assumed. Based on this information, the travel time factor value assigned is 25.
- There is no reported drinking water wells located within the 4-mile target distance limit (TDL). As a result, the corresponding population factor value is 0. The nearest well is located greater than 5 miles from the site resulting a nearest well factor value of 0.
- The site is not located within a groundwater wellhead protection area.
- Groundwater within the 4-mile TDL is not used for irrigation, livestock watering, and industrial uses, resulting in an assigned resources factor value of 0.

Surface Water Migration Pathway

The Upper Musick Mine watershed received a score of 0 due to the lack of targets. The Lower Music Mine watershed received a score of 24.04. The Lower Musick Mine score was driven primarily by the human food chain threat as described below. Potential sources were assumed to consist of contaminated soil in the waste rock piles, tailings pile, and stamp mill area.

The Upper Musick Mine and Lower Musick Mine have separate surface water drainage pathways and thus were evaluated as separate watersheds. The Upper Musick Mine is located on the eastern side of the Bohemia saddle and drains eastward into the headwaters of City Creek. There are two surface water flow pathways draining separate source areas at Upper Musick Mine and two PPEs are located on City Creek. The Lower Musick Mine is located on the western side of the Bohemia saddle and drains westward into Glenwood Creek. A single surface water overland flow pathway exists at the Lower Music Mine that flows to a single PPE on Glenwood

Creek. The 15-mile TDL for Upper Musick Mine begins at the PPEs into City Creek. City Creek flows approximately 7 miles to the confluence with Steamboat Creek. The 15-mile TDL continues 8 miles along Steamboat Creek to the end of the 15 mile TDL. The 15-mile TDL for the Lower Musick Mine begins at the PPE into Glenwood Creek and extends approximately 1¼ miles west to the confluence with Bohemia Creek. The 15-mile TDL continues approximately ½ mile along Bohemia Creek to its confluence with the Sharps Creek and an additional 13 ¼ miles along the Sharps Creek to the end of the 15 mile TDL. Surface water and sediment samples collected from within the surface water pathway in-water segment are described below.

Upper Musick Mine— One sediment sample was collected at each of the two PPEs in City Creek. A third sediment sample (and co-located surface water sample) was collected approximately 6 miles downstream at the confluence with Steamboat Creek. Attribution surface water and sediment samples were collected from Steamboat Creek upstream of the confluence and from a tributary stream draining the Champion mine area. A total of eight metals attributable to site sources were detected in City Creek sediments at concentrations elevated above background. No metals were detected at elevated concentrations in surface water. The eight metals detected in sediments consist of antimony, cadmium, cobalt, copper, lead, manganese, mercury, and zinc. The attribution sampling results do not support the removal of any of these eight metals from consideration as an observed release.

Lower Musick Mine— Surface water and sediment samples were collected from the PPE in Glenwood Creek and from a location situated approximately ½ miles downstream. An attribution surface water and sediment sample was also collected from Glenwood Creek at an upstream location. A total of seven metals attributable to site sources were detected in Glenwood Creek sediments at concentrations elevated above background. No metals were detected at elevated concentrations in surface water. The seven metals detected in sediments consist of antimony, cadmium, cobalt, lead, mercury, nickel, and zinc. The sampling results from the upstream attribution sample do not support the removal of any of these seven metals from consideration as an observed release.

Factors and assumptions used to evaluate the surface water pathway score are summarized below.

- A likelihood of release category factor value of 550 was assigned for both mine areas based on elevated concentrations of metals in sediment associated with the Lower and Upper Musick Mine surface water pathway in-water segments.
- There are no documented surface water intakes or surface water rights associated with irrigation, livestock watering, industry use, and/or storage within each 15-mile TDL. As such, the drinking water threat score for each area is 0.
- A limited sport fishery exists in the Sharps Creek drainage within the Lower Musick Mine 15-mile TDL. The fishery was evaluated as subject to potential human food chain

contamination. It was assumed that a maximum of 99 pounds of fish are harvested from within the 15-mile TDL. The associated food chain individual factor value of 20 was the primary driver in the resulting human food chain threat score of 24 for the Lower Musick Mine. No fishery exists within the Upper Musick Mine 15-mile TDL, resulting in a human food chain threat score of zero.

- No known habitat for federal or state threatened or endangered species exists within the either surface water pathway. Wetland frontage along the Upper Musick Mine 15-mile TDL consists of approximately 1 mile of wetland frontage along Steamboat Creek. Wetland frontage along the Lower Musick Mine 15-mile TDL consists of approximately ¼ mile of wetland frontage along Sharps Creek. Wetlands under the environmental threat were evaluated based on potential contamination. The resulting environmental threat score is 0 for the Upper Musick Mine and 0.06 for the Lower Musick mine. The difference in scores is due to the difference in size between Sharps Creek (moderate to large stream) and Steamboat Creek (large stream to river).

Soil Exposure Pathway

The soil exposure pathway for both mine areas received a pathway score of 12. All exposed source areas with surface soil containing concentrations significantly above background were assumed to be areas of observed contamination for the pathway. Factors and assumptions are summarized below.

- Based on soil samples collected and assumptions made, an area of approximately 31,300 square feet of observed contamination was established at the Upper Musick Mine and an area of approximately 9,600 square feet of observed contamination was established at the Lower Musick Mine. A likelihood of exposure factor value of 550 was assigned for both mine areas based on the presence of observed contamination.
- No resident individuals, workers, or resources are located on or within 200 feet of an area of observed contamination. However, both mine areas are located in designated critical habitat for the federal- and state- listed threatened species the northern spotted owl (*Strix occidentalis caurina*). The presence of critical habitat results in a terrestrial sensitive environments factor value of 100 and a resident population category threat score of 990,000 for each mine area.
- Each mine area is slightly accessible with a corresponding attractiveness/accessibility factor value of 25. There is no recorded resident population recorded living within 1 mile of observed contamination. The resulting nearby individual and population within 1 mile factor values are 0 for each mine area.

Air Migration Pathway

The air migration pathway for both mine areas received a score of 0.08 based on a potential to release from contaminated soil. Potential sources were assumed to consist of contaminated soil in the waste rock piles, tailings pile, and stamp mill area. Factors and assumptions contributing to the pathway scores are summarized below.

- A category factor value of 220 was scored for each area for the likelihood of release category based on a particulate containment value of 10, a particulate source type factor of 22, and a particulate migration potential of 0.
- The nearest individual and nearby population factor values for each area are 0 based on the lack of recorded residential populations within the 4-mile TDL.
- Musick Mine is located within a major designated recreational area; the resulting resource factor value for each mine area is 5.
- There are approximately 19 acres of wetlands within each area's 4-mile TDL. The American peregrine falcon (*Falco peregrinus anatum*), a state-listed endangered species, has been observed within each 4-mile TDL. The presence of the northern spotted owl (*Strix occidentalis caurina*), a federal- and state-listed threatened species, has been documented within each 4-mile TDL. In addition, lands within each 4-mile TDL have been designated critical habitat for the spotted owl. The resulting sensitive environments factor value for each area is 4.4. It was conservatively assumed that the falcon and spotted owl occur within the greater than 0 to ¼ mile distance category.

Conclusions

Preliminary HRS scores of 6 and 13.43 were derived for the Upper Musick Mine and a Lower Musick Mine respectively. The surface water pathway for the Lower Musick Mine watershed, which generated a pathway score of 24.04, was the only pathway that significantly drove the overall score for that mine area. The surface water pathway score was primarily influenced by the presence of a fishery within the 15-mile TDL subject to potential human food chain contamination.

Based on the data presently available and the conservative assumptions made, the preliminary HRS scores for the Musick Mine site are not sufficient to make the site a candidate for further consideration under the National Priorities List (NPL).

ATTACHMENT 1
QUICK SCORE SCORESHEETS

LOWER MUSICK SCORESHEETS

**** CONFIDENTIAL ****
 ****PRE-DECISIONAL DOCUMENT ****
 **** SUMMARY SCORESHEET ****
 **** FOR COMPUTING PROJECTED HRS SCORE ****

**** Do Not Cite or Quote ****



Site Name: Lower Musick Mine

Region: 10

City, County, State: Lane OR

Evaluator: David Dinkuhn

EPA ID#: NA

Date: 5/13/2005

Lat/Long: N 42d 34m 42s W 122d 39m 10s T/R/S:

Congressional District:

This Scoresheet is for: Combined PA/SI

Scenario Name: Scenario 1

Description: All sources are combined

	S pathway	S ² pathway
Ground Water Migration Pathway Score (S _{gw})	0	0
Surface Water Migration Pathway Score (S _{sw})	24.04	577.9216
Soil Exposure Pathway Score (S _s)	12	144
Air Migration Score (S _a)	0.0352	0.00123904
$S_{gw}^2 + S_{sw}^2 + S_s^2 + S_a^2$		721.9228
$(S_{gw}^2 + S_{sw}^2 + S_s^2 + S_a^2)/4$		180.4807
$\sqrt{(S_{gw}^2 + S_{sw}^2 + S_s^2 + S_a^2)/4}$		13.43

* Pathways not assigned a score (explain):

TABLE 3-1 --GROUND WATER MIGRATION PATHWAY SCORESHEET

Factor categories and factors	Maximum Value	Value Assigned
Aquifer Evaluated:		
Likelihood of Release to an Aquifer:		
1. Observed Release	550	0
2. Potential to Release:		
2a. Containment	10	10
2b. Net Precipitation	10	10
2c. Depth to Aquifer	5	5
2d. Travel Time	35	25
2e. Potential to Release [(lines 2a(2b + 2c + 2d)]	500	400
3. Likelihood of Release (higher of lines 1 and 2e)	550	400
Waste Characteristics:		
4. Toxicity/Mobility	(a)	100
5. Hazardous Waste Quantity	(a)	10
6. Waste Characteristics	100	6
Targets:		
7. Nearest Well	(b)	0
8. Population:		
8a. Level I Concentrations	(b)	0
8b. Level II Concentrations	(b)	0
8c. Potential Contamination	(b)	0
8d. Population (lines 8a + 8b + 8c)	(b)	0
9. Resources	5	0
10. Wellhead Protection Area	20	0
11. Targets (lines 7 + 8d + 9 + 10)	(b)	0
Ground Water Migration Score for an Aquifer:		
12. Aquifer Score [(lines 3 x 6 x 11)/82,5000] ^c	100	0
Ground Water Migration Pathway Score:		
13. Pathway Score (S_{gw}), (highest value from line 12 for all aquifers evaluated) ^c	100	0

^a Maximum value applies to waste characteristics category^b Maximum value not applicable^c Do not round to nearest integer

TABLE 4-1 --SURFACE WATER OVERLAND/FLOOD MIGRATION COMPONENT SCORESHEET

Factor categories and factors	Maximum Value	Value Assigned
Watershed Evaluated:		
Drinking Water Threat		
Likelihood of Release:		
1. Observed Release	550	550
2. Potential to Release by Overland Flow:		
2a. Containment	10	
2b. Runoff	10	
2c. Distance to Surface Water	5	
2d. Potential to Release by Overland Flow [(lines 2a(2b + 2c))]	35	
3. Potential to Release by Flood:		
3a. Containment (Flood)	10	
3b. Flood Frequency	50	
3c. Potential to Release by Flood (lines 3a x 3b)	500	
4. Potential to Release (lines 2d + 3c, subject to a maximum of 500)	500	
5. Likelihood of Release (higher of lines 1 and 4)	550	550
Waste Characteristics:		
6. Toxicity/Persistence	(a)	10000
7. Hazardous Waste Quantity	(a)	10
8. Waste Characteristics	100	18
Targets:		
9. Nearest Intake	50	0
10. Population:		
10a. Level I Concentrations	(b)	0
10b. Level II Concentrations	(b)	0
10c. Potential Contamination	(b)	0
10d. Population (lines 10a + 10b + 10c)	(b)	0
11. Resources	5	0
12. Targets (lines 9 + 10d + 11)	(b)	0
Drinking Water Threat Score:		
13. Drinking Water Threat Score [(lines 5x8x12)/82,500, subject to a max of 100]	100	0
Human Food Chain Threat		
Likelihood of Release:		
14. Likelihood of Release (same value as line 5)	550	550
Waste Characteristics:		
15. Toxicity/Persistence/Bioaccumulation	(a)	500000000
16. Hazardous Waste Quantity	(a)	10
17. Waste Characteristics	1000	180
Targets:		
18. Food Chain Individual	50	20
19. Population		
19a. Level I Concentration	(b)	0
19b. Level II Concentration	(b)	0
19c. Potential Human Food Chain Contamination	(b)	3E-5
19d. Population (lines 19a + 19b + 19c)	(b)	0.03
20. Targets (lines 18 + 19d)	(b)	20
Human Food Chain Threat Score:		
21. Human Food Chain Threat Score [(lines 14x17x20)/82500, subject to max of 100]	100	24
Environmental Threat		
Likelihood of Release:		
22. Likelihood of Release (same value as line 5)	550	550
Waste Characteristics:		
23. Ecosystem Toxicity/Persistence/Bioaccumulation	(a)	500000000

24. Hazardous Waste Quantity	(a)	10	
25. Waste Characteristics	1000		180
Targets:			
26. Sensitive Environments			
26a. Level I Concentrations	(b)	0	
26b. Level II Concentrations	(b)	0	
26c. Potential Contamination	(b)	0.025	
26d. Sensitive Environments (lines 26a + 26b + 26c)	(b)	0.03	
27. Targets (value from line 26d)	(b)		0.03
Environmental Threat Score:			
28. Environmental Threat Score [(lines 22x25x27)/82,500 subject to a max of 60]	60		0.04
Surface Water Overland/Flood Migration Component Score for a Watershed			
29. Watershed Score ^c (lines 13+21+28, subject to a max of 100)	100		24.04
Surface Water Overland/Flood Migration Component Score			
30. Component Score (S _{sw}) ^c (highest score from line 29 for all watersheds evaluated)	100		24.04
^a Maximum value applies to waste characteristics category			
^b Maximum value not applicable			
^c Do not round to nearest integer			

TABLE 5-1 --SOIL EXPOSURE PATHWAY SCORESHEET

Factor categories and factors	Maximum Value	Value Assigned
Likelihood of Exposure:		
1. Likelihood of Exposure	550	550
Waste Characteristics:		
2. Toxicity	(a)	10000
3. Hazardous Waste Quantity	(a)	10
4. Waste Characteristics	100	18
Targets:		
5. Resident Individual	50	0
6. Resident Population:		
6a. Level I Concentrations	(b)	0
6b. Level II Concentrations	(b)	0
6c. Population (lines 6a + 6b)	(b)	0
7. Workers	15	0
8. Resources	5	0
9. Terrestrial Sensitive Environments	(c)	100
10. Targets (lines 5 + 6c + 7 + 8 + 9)	(b)	100
Resident Population Threat Score		
11. Resident Population Threat Score (lines 1 x 4 x 10)	(b)	990000
Nearby Population Threat		
Likelihood of Exposure:		
12. Attractiveness/Accessibility	100	25
13. Area of Contamination	100	20
14. Likelihood of Exposure	500	5
Waste Characteristics:		
15. Toxicity	(a)	10000
16. Hazardous Waste Quantity	(a)	10
17. Waste Characteristics	100	18
Targets:		
18. Nearby Individual	1	0
19. Population Within 1 Mile	(b)	0
20. Targets (lines 18 + 19)	(b)	0
Nearby Population Threat Score		
21. Nearby Population Threat (lines 14 x 17 x 20)	(b)	0
Soil Exposure Pathway Score:		
22. Pathway Score ^d (S _s), [(lines (11+21)/82,500, subject to max of 100]	100	12

^a Maximum value applies to waste characteristics category

^b Maximum value not applicable

^c No specific maximum value applies to factor. However, pathway score based solely on terrestrial sensitive environments is limited to a maximum of 60

^d Do not round to nearest integer

TABLE 6-1 --AIR MIGRATION PATHWAY SCORESHEET

Factor categories and factors	Maximum Value	Value Assigned
Likelihood of Release:		
1. Observed Release	550	0
2. Potential to Release:		
2a. Gas Potential to Release	500	0
2b. Particulate Potential to Release	500	220
2c. Potential to Release (higher of lines 2a and 2b)	500	220
3. Likelihood of Release (higher of lines 1 and 2c)	550	220
Waste Characteristics:		
4. Toxicity/Mobility	(a)	80
5. Hazardous Waste Quantity	(a)	10
6. Waste Characteristics	100	3
Targets:		
7. Nearest Individual	50	0
8. Population:		
8a. Level I Concentrations	(b)	0
8b. Level II Concentrations	(b)	0
8c. Potential Contamination	(c)	0
8d. Population (lines 8a + 8b + 8c)	(b)	0
9. Resources	5	0
10. Sensitive Environments:		
10a. Actual Contamination	(c)	0
10b. Potential Contamination	(c)	4.4
10c. Sensitive Environments (lines 10a + 10b)	(c)	4.4
11. Targets (lines 7 + 8d + 9 + 10c)	(b)	4.4
Air Migration Pathway Score:		
12. Pathway Score (S_a) $[(\text{lines } 3 \times 6 \times 11)/82,500]^d$	100	0.0352

^a Maximum value applies to waste characteristics category

^b Maximum value not applicable

^c No specific maximum value applies to factor. However, pathway score based solely on sensitive environments is limited to a maximum of 60.

^d Do not round to nearest integer

UPPER MUSICK SCORESHEETS

**** CONFIDENTIAL ****
 ****PRE-DECISIONAL DOCUMENT ****
 **** SUMMARY SCORESHEET ****
 **** FOR COMPUTING PROJECTED HRS SCORE ****

**** Do Not Cite or Quote ****

Site Name: Upper Musick Mine

Region: 10

City, County, State: Lane OR

Evaluator: David Dinkuhn

EPA ID#: NA

Date: 2/4/2005

Lat/Long: N 42d 34m 42s W 122d 39m 10s T/R/S:

Congressional District:

This Scoresheet is for: Combined PA/SI

Scenario Name: Scenario 1

Description: All sources are combined

	S pathway	S ² pathway
Ground Water Migration Pathway Score (S _{gw})	0	0
Surface Water Migration Pathway Score (S _{sw})	0	0
Soil Exposure Pathway Score (S _s)	12	144
Air Migration Score (S _a)	0.0352	0.00123904
$S_{gw}^2 + S_{sw}^2 + S_s^2 + S_a^2$		144.00123904
$(S_{gw}^2 + S_{sw}^2 + S_s^2 + S_a^2)/4$		36.00030976
$\sqrt{(S_{gw}^2 + S_{sw}^2 + S_s^2 + S_a^2)/4}$		6

* Pathways not assigned a score (explain):

TABLE 3-1—GROUND WATER MIGRATION PATHWAY SCORESHEET

Factor categories and factors	Maximum Value	Value Assigned
Aquifer Evaluated:		
Likelihood of Release to an Aquifer:		
1. Observed Release	550	0
2. Potential to Release:		
2a. Containment	10	10
2b. Net Precipitation	10	10
2c. Depth to Aquifer	5	5
2d. Travel Time	35	25
2e. Potential to Release [(lines 2a(2b + 2c + 2d)]	500	400
3. Likelihood of Release (higher of lines 1 and 2e)	550	400
Waste Characteristics:		
4. Toxicity/Mobility	(a)	100
5. Hazardous Waste Quantity	(a)	10
6. Waste Characteristics	100	6
Targets:		
7. Nearest Well	(b)	0
8. Population:		
8a. Level I Concentrations	(b)	0
8b. Level II Concentrations	(b)	0
8c. Potential Contamination	(b)	0
8d. Population (lines 8a + 8b + 8c)	(b)	0
9. Resources	5	0
10. Wellhead Protection Area	20	0
11. Targets (lines 7 + 8d + 9 + 10)	(b)	0
Ground Water Migration Score for an Aquifer:		
12. Aquifer Score [(lines 3 x 6 x 11)/82,500] ^c	100	0
Ground Water Migration Pathway Score:		
13. Pathway Score (S_{gw}), (highest value from line 12 for all aquifers evaluated) ^c	100	0

^a Maximum value applies to waste characteristics category^b Maximum value not applicable^c Do not round to nearest integer

TABLE 4-1—SURFACE WATER OVERLAND/FLOOD MIGRATION COMPONENT SCORESHEET

Factor categories and factors	Maximum Value	Value Assigned
Watershed Evaluated:		
Drinking Water Threat		
Likelihood of Release:		
1. Observed Release	550	550
2. Potential to Release by Overland Flow:		
2a. Containment	10	
2b. Runoff	10	
2c. Distance to Surface Water	5	
2d. Potential to Release by Overland Flow [(lines 2a(2b + 2c)]	35	
3. Potential to Release by Flood:		
3a. Containment (Flood)	10	
3b. Flood Frequency	50	
3c. Potential to Release by Flood (lines 3a x 3b)	500	
4. Potential to Release (lines 2d + 3c, subject to a maximum of 500)	500	
5. Likelihood of Release (higher of lines 1 and 4)	550	550
Waste Characteristics:		
6. Toxicity/Persistence	(a)	10000
7. Hazardous Waste Quantity	(a)	10
8. Waste Characteristics	100	18
Targets:		
9. Nearest Intake	50	0
10. Population:		
10a. Level I Concentrations	(b)	0
10b. Level II Concentrations	(b)	0
10c. Potential Contamination	(b)	0
10d. Population (lines 10a + 10b + 10c)	(b)	0
11. Resources	5	0
12. Targets (lines 9 + 10d + 11)	(b)	0
Drinking Water Threat Score:		
13. Drinking Water Threat Score [(lines 5x8x12)/82,500, subject to a max of 100]	100	0
Human Food Chain Threat		
Likelihood of Release:		
14. Likelihood of Release (same value as line 5)	550	550
Waste Characteristics:		
15. Toxicity/Persistence/Bioaccumulation	(a)	500000000
16. Hazardous Waste Quantity	(a)	10
17. Waste Characteristics	1000	180
Targets:		
18. Food Chain Individual	50	0
19. Population		
19a. Level I Concentration	(b)	0
19b. Level II Concentration	(b)	0
19c. Potential Human Food Chain Contamination	(b)	0
19d. Population (lines 19a + 19b + 19c)	(b)	0
20. Targets (lines 18 + 19d)	(b)	0
Human Food Chain Threat Score:		
21. Human Food Chain Threat Score [(lines 14x17x20)/82500, subject to max of 100]	100	0
Environmental Threat		
Likelihood of Release:		
22. Likelihood of Release (same value as line 5)	550	550
Waste Characteristics:		
23. Ecosystem Toxicity/Persistence/Bioaccumulation	(a)	500000000
24. Hazardous Waste Quantity	(a)	10
25. Waste Characteristics	1000	180

TABLE 4-1—SURFACE WATER OVERLAND/FLOOD MIGRATION COMPONENT SCORESHEET

Factor categories and factors	Maximum Value	Value Assigned
Targets:		
26. Sensitive Environments		
26a. Level I Concentrations	(b)	0
26b. Level II Concentrations	(b)	0
26c. Potential Contamination	(b)	0.0025
26d. Sensitive Environments (lines 26a + 26b + 26c)	(b)	0
27. Targets (value from line 26d)	(b)	0
Environmental Threat Score:		
28. Environmental Threat Score [(lines 22x25x27)/82,500 subject to a max of 60]	60	0
Surface Water Overland/Flood Migration Component Score for a Watershed		
29. Watershed Score ^c (lines 13+21+28, subject to a max of 100)	100	0
Surface Water Overland/Flood Migration Component Score		
30. Component Score (S_{sw}) ^c (highest score from line 29 for all watersheds evaluated)	100	0

^a Maximum value applies to waste characteristics category^b Maximum value not applicable^c Do not round to nearest integer

TABLE 5-1—SOIL EXPOSURE PATHWAY SCORESHEET

Factor categories and factors	Maximum Value	Value Assigned
Likelihood of Exposure:		
1. Likelihood of Exposure	550	550
Waste Characteristics:		
2. Toxicity	(a)	10000
3. Hazardous Waste Quantity	(a)	10
4. Waste Characteristics	100	18
Targets:		
5. Resident Individual	50	0
6. Resident Population:		
6a. Level I Concentrations	(b)	0
6b. Level II Concentrations	(b)	0
6c. Population (lines 6a + 6b)	(b)	0
7. Workers	15	0
8. Resources	5	0
9. Terrestrial Sensitive Environments	(c)	100
10. Targets (lines 5 + 6c + 7 + 8 + 9)	(b)	100
Resident Population Threat Score		
11. Resident Population Threat Score (lines 1 x 4 x 10)	(b)	990000
Nearby Population Threat		
Likelihood of Exposure:		
12. Attractiveness/Accessibility	100	25
13. Area of Contamination	100	20
14. Likelihood of Exposure	500	5
Waste Characteristics:		
15. Toxicity	(a)	10000
16. Hazardous Waste Quantity	(a)	10
17. Waste Characteristics	100	18
Targets:		
18. Nearby Individual	1	0
19. Population Within 1 Mile	(b)	0
20. Targets (lines 18 + 19)	(b)	0
Nearby Population Threat Score		
21. Nearby Population Threat (lines 14 x 17 x 20)	(b)	0
Soil Exposure Pathway Score:		
22. Pathway Score ^d (S _s), [lines (11+21)/82,500, subject to max of 100]	100	12

^a Maximum value applies to waste characteristics category^b Maximum value not applicable^c No specific maximum value applies to factor. However, pathway score based solely on terrestrial sensitive environments is limited to a maximum of 60^d Do not round to nearest integer

TABLE 6-1—AIR MIGRATION PATHWAY SCORESHEET

Factor categories and factors	Maximum Value	Value Assigned
Likelihood of Release:		
1. Observed Release	550	0
2. Potential to Release:		
2a. Gas Potential to Release	500	0
2b. Particulate Potential to Release	500	220
2c. Potential to Release (higher of lines 2a and 2b)	500	220
3. Likelihood of Release (higher of lines 1 and 2c)	550	220
Waste Characteristics:		
4. Toxicity/Mobility	(a)	80
5. Hazardous Waste Quantity	(a)	10
6. Waste Characteristics	100	3
Targets:		
7. Nearest Individual	50	0
8. Population:		
8a. Level I Concentrations	(b)	0
8b. Level II Concentrations	(b)	0
8c. Potential Contamination	(c)	0
8d. Population (lines 8a + 8b + 8c)	(b)	0
9. Resources	5	0
10. Sensitive Environments:		
10a. Actual Contamination	(c)	0
10b. Potential Contamination	(c)	4.4
10c. Sensitive Environments (lines 10a + 10b)	(c)	4.4
11. Targets (lines 7 + 8d + 9 + 10c)	(b)	4.4
Air Migration Pathway Score:		
12. Pathway Score (S_a) $[(\text{lines } 3 \times 6 \times 11)/82,500]^d$	100	0.0352

^a Maximum value applies to waste characteristics category^b Maximum value not applicable^c No specific maximum value applies to factor. However, pathway score based solely on sensitive environments is limited to a maximum of 60.^d Do not round to nearest integer